# Poor physical function, pain, and limited exercise: Risk factors for premature mortality in the range of hypertension and smoking, identified on a simple patient self-report questionnaire for usual care

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**Poor physical function, pain, and limited exercise: Risk factors for premature mortality in the range of hypertension and smoking, identified on a simple patient self-report questionnaire for usual care**

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**ABSTRACT (238 words)**

**Objective:** To analyze poor physical function, pain, limited exercise and smoking, collected on a standard patient self-report questionnaire, to predict 5-year mortality in individuals in a general older population.

**Methods:** An extended version of a Multidimensional Health Assessment Questionnaire (MDHAQ) was mailed to 2000 subjects in Finland who were randomly identified as a control population for a rheumatoid arthritis cohort.  The questionnaire was returned by 1,573 subjects.  The questionnaire included scores for baseline physical function, pain, exercise and smoking status, age, and 25 medical conditions, including hypertension.  Five-year survival was analyzed according to all baseline variables.

**Results:** Five-year survival was 94% in all subjects, 98% in subjects with no disease or no acutely life-threatening disease, and 17% in subjects with an acutely life-threatening disease.  Hazard ratios in all subjects to die over 5 years were 3.5, 2.2, 5.2 and 4.6 for poor physical function, pain, limited exercise and smoking, respectively, with 5-year survival of 93%, 97%, 93% and 95%, respectively, compared to 91% for hypertension. Each of the four patient history variables predicted mortality at higher levels in individuals who reported <u>no</u> versus an acutely life-threatening condition, in whom the condition dominated prognosis for survival.

**Conclusions:** Poor physical function, pain, limited exercise, and smoking are potentially modifiable risk factors for premature mortality in the general population, which may be assessed systematically in all individuals in the infrastructure of medical care and health maintenance on a simple standard MDHAQ.

### ARTICLE SUMMARY

**Article focus:**

- To analyze poor physical function, pain, limited exercise and smoking as reversible risk factors to predict 5-year mortality in individuals in a general older population.

- Can the information can be collected as quantitative, standard patient-history scores on a simple, one-page patient self-report questionnaire?

- Are these risk factors are seen in individuals who do not report any potentially acutely life-threatening disease?

**Key messages:**

- Poor physical function, pain, and limited exercise are potentially modifiable risk factors for premature mortality in the general population.

- These patient history-derived risk factors are in the range of hypertension and smoking as potentially reversible risk factors for mortality.

- Most medical visits do not include any systematic quantitative collection of standard quantitative scores for physical function, pain, exercise status, and even smoking, but these are easily collected on a simple questionnaire.

**Strengths and limitations of this study:**

*Strengths:*

- Population-based sample

- Survey returned by 1,573 of 2,000 subjects (79%)

- Questionnaire easily used in any clinical or research setting

*Limitations:*

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- No laboratory tests were available – it might be of considerable interest to compare these medical history variables with laboratory tests, such as serum cholesterol, in the prognosis of mortality, and whether a component of the risk may be explained by one or more of the reported medical history variables, or whether the prognosis according to the laboratory test is "explained" by a patient measure.

- All subjects were from Finland, although most data suggest that mortality experience in Finland is similar to that found in most Western countries, and reports from many countries have indicated that each of these variables is prognostic of premature mortality.

- Diagnoses were available only from self-report, which can be inaccurate for certain diagnoses. However, the excess risk according to physical function, pain, and exercise status was greater in subjects who reported no acutely life-threatening diseases.

**INTRODUCTION**

Poor physical function,[1-7] pain,[3, 8-10] limited exercise,[11, 12] and smoking[13, 14] each are significant potentially modifiable risk factors for mortality derived from a medical history. However, these (and other) risk factors for premature mortality derived from a patient history generally are not assessed systematically in most usual medical care and health promotion settings,[13, 15] unlike blood pressure or serum cholesterol, although they might be associated with similar risks for mortality. This situation may result in part from the absence of a standard simple structured format for recording patient history variables, in contrast to vital signs or laboratory tests.

Medical history information concerning physical function, pain, exercise and smoking status may be collected as standard "scientific" data on a simple self-report questionnaire. A two-page version of a multidimensional health assessment questionnaire (MDHAQ)[16, 17] (Figure 1) can be completed by patients in 5–10 minutes in any setting, with minimal additional burden on health professionals.[18] Analysis of 5-year survival according to baseline data collected on a questionnaire providing these variables as quantitative scores, as well as review of systems and recent medical history, in a randomly-identified older Finnish population is presented in this report.

**METHODS**

**Subjects**

The subjects included 1,523 older individuals in the general population of the Central Finland District. Initially, 2,000 individuals were identified randomly from the Finnish Population Registry as a "control" population for a cohort of 1,500 people with

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rheumatoid arthritis who are being monitored for long-term outcomes.[19]  The cohort was

designed to include 70% females, with mean age of 55 years, but with no selection

criteria other than age and sex.

A self-report questionnaire (which included the items in Figure 1, plus additional

items designed for further longitudinal research) was mailed to 2,000 randomly-

identified older individuals in the general population, and returned by 1,523 (76%).  Five

years later, in September 2005, the vital status of all subjects was ascertained from the

Finnish Population Registry.  The study was approved by the Ethics Committees of

Jyväskylä Central Hospital and Population Register Centre of Finland.


**Self-report questionnaire**

A self-report questionnaire mailed to patients included the items on the MDHAQ

in Figure 1, and additional queries for a research study.  Physical function was queried

on a version of the original Health Assessment Questionnaire (HAQ),[20] which queries

20 activities of daily living, scored 0–3, with a mean overall physical function score of 0–

3; similar results are seen with inclusion of only 10 activities on a MDHAQ.[16, 17]  Pain is

assessed on a 10 cm pain visual analog scale (VAS) (0="No pain," 10="Pain as bad as

it could be").  The frequency of aerobic exercise is queried with five response options:

"≥3 times weekly," "1-2 times weekly," "1-2 times monthly," "no exercise," and "cannot

exercise because of health conditions."  Smoking status is queried as a response to "Do

you smoke cigarettes at this time?" with simple "Yes/No" response options.  The

presence of 25 health conditions (Table 1), which is not included in the MDHAQ for

usual clinical care, was queried as "Which of the following conditions have you ever had

at any time?" listing conditions found in Table 1, with "Yes/No" response options.  The

standard MDHAQ includes date of birth as well as recent medical history, symptom

checklist review of systems, and other variables.[21, 22]

**Statistical analyses**

Survival of all subjects over 5 years was computed according to self-report of

each individual condition, age, physical function, pain, exercise frequency, and smoking.

Analyses of mortality according to continuous variables were computed as median and

mean values, and for dichotomous variables as percentages in each category.

Statistical significance was analyzed according to a t-test and analysis of covariance for

continuous variables and chi-square test for dichotomous variables.

Kaplan-Meier curves and Cox proportional hazard regression models were

computed to analyze time-to-death in subjects according to: *a)* physical function scores

(range 0–3)  of <1 versus ≥1, indicating moderate difficulty to perform activities of daily

living;  *b)* pain VAS scores (range 0–100) of ≤40 versus >40, indicating moderate pain;

*c)* frequency of physical exercise of "1 or more times weekly" versus "less than once

weekly"; *d)* current smoking status, analyzed as yes or no.  Multivariate models were

analyzed for physical function and pain as continuous variables, as well as according to

clinical cutpoints that could highlight possible severe problems, such as physical

function of ≥1.0 versus <1 on a scale of 0-3, and pain of >40 versus ≤40 on a 0-100

visual analog scale (VAS).  Some analyses were stratified according to age, and

multivariate computations were adjusted for age, sex, and type of health condition.

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Survival was also analyzed for subjects classified into three categories on the basis of results of the survey: no reported health condition; one or more condition(s) but no acutely life-threatening condition; and one or more acutely life-threatening condition(s), as defined by the findings described in Results. Few deaths occurred in those who reported no health condition, and further analyses were performed in two categories: no condition or no acutely life-threatening condition versus one or more acutely life-threatening condition(s).

**Role of the funding source**

No specific funding source was available for these studies. The authors are solely responsible for the study design; collection, analysis and interpretation of data; writing the report; and a decision to submit the paper for publication.

**RESULTS**

**Overall mortality in the cohort**

The mean age of the 1,523 individuals in the study population was 55 years (range 30-91 years), and 72% were females. Among the 1,523 subjects, 92 (6.0%) died over the subsequent 5 years. Eight of 25 health conditions were found associated with 5-year mortality rates of 19% or more, and were classified as "acutely life-threatening diseases," i.e., coronary artery disease, other heart diseases, chronic kidney disease, chronic bronchitis, chronic leg ulcers, diabetes, cancer and stroke. The 17 other conditions with subsequent 5-year mortality rates of 17% or less were classified as "non-acutely life-threatening diseases," i.e., hypertension, peptic ulcer, inflammatory gut

disease, asthma, thyroid disease, Parkinson's disease, epilepsy, other neurologic

diseases, chronic back pain, fibromyalgia, psoriasis, psychiatric diseases, alcoholism,

osteoarthritis, musculoskeletal trauma, rheumatoid arthritis and ankylosing spondylitis.

The 92 deaths included 8 of 429 (1.9%) who had reported no health condition, 21

of 728 (2.9%) with a non-acutely life-threatening condition, and 63 of 366 (17.2%) with

one or more acutely life-threatening conditions (Table 1) (some patients had 2 or 3 such

conditions, so total mortality was less than 19%).  The 8 subjects with no health

condition and 21 with no acutely life-threatening conditions were pooled for further

mortality analyses as 29 (2.5%) of 1,157 subjects with no condition or no acutely life-

threatening condition who died within 5 years. The mean baseline age of all patients

who survived or died over the 5-year period was 54 and 75 years, respectively (p

<0.001) (Table 2), including 51 and 69 years in subjects with no conditions or no acutely

life-threatening conditions (p <0.001), and 65 and 77 years in subjects with an acutely

life-threatening condition (p <0.001).

**Survival according to medical history variables**

Cumulative survival in the entire population differed according to physical

function scores: 98% with scores <1 (on a 0-3 scale) survived versus 93% with scores

≥1 (Figure 2).  Survival was 99% in those with pain VAS scores ≤4 versus 97% in those

with pain scores >4.  Survival was >99% in those who exercised more than once weekly,

97% in those who exercised once weekly, and 93% in those who did not exercise.

Survival was 98% in non-smokers versus 95% in smokers (Figure 2).  Further analyses

of survival according to each of the four variables are presented below.

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**Physical function scores and mortality risk**

Mean physical function scores were 0.27 (on a scale of 0–3) in all subjects,

including 0.20 in those who survived and 1.4 in those who died over the 5-year period (p

<0.001) (Table 2).  In the 1,257 subjects with no conditions or no acutely life-threatening

conditions, mean physical function scores were 0.16, including 0.13 for those who

survived and 1.1 for those who died (p <0.001) (Table 2).  In the 366 subjects with

acutely life-threatening conditions, mean physical function scores were 0.63, including

0.45 in those who survived and 1.5 in those who died (p <0.001) (Table 2).  The hazard

ratio and 95% confidence interval (CI) for mortality over 5 years for physical function

scores $\geq 1$ (on a scale of 0–3), was 3.5 (95% CI: 2.1–5.1) for all subjects, 4.5 (95% CI:

1.6–12.6) for those with non-acutely life-threatening conditions, and 3.1 (95% CI: 1.8–

5.5) for those with acutely life-threatening conditions (Table 3).

**Pain scores and mortality risk**

The mean pain score was 20 (on a scale of 0–100) in all subjects, including a

mean level of 19 in those who survived compared to 38 in those who died over the next

5 years (p <0.001) (Table 2).  The mean pain score in individuals with no condition or no

acutely life-threatening condition was 16, including 16 in those who survived compared

to 27 in those who died (p = 0.020) (Table 2).  The mean pain score in subjects with an

acutely life-threatening condition was 34, including 32 in those who survived compared

to 43 in those who died over the next 5 years (p = 0.008).  The hazard ratio (with 95%

CI) for mortality over 5 years if pain scores were >40 compared to $\leq 40$ (on a scale of 0–

100) was 2.2 (95% CI: 1.3–3.5) for all subjects (Table 3), 3.1 (95% CI: 1.2–8.3) for

those with non-acutely life-threatening conditions, but 1.5 (95% CI: 0.9–2.8) for those

with acutely life-threatening conditions, not meeting the p<0.05 criterion (p <0.16).


**Exercise frequency and mortality risk**

Among all individuals, 28% exercised less than once per week, including 26% of

those who survived and 76% of those who died over the 5 years (Table 2).  Among

subjects with no conditions or no acutely life-threatening conditions, 25% exercised less

than once per week, including 24% who survived versus 63% who died (Table 2).

Among subjects who had an acutely life-threatening condition, 40% exercised less than

once per week, including 33% who survived and 82% who died.  The hazard ratio (with

95% CI) for death over 5 years among subjects who exercised less than once per week

compared to those who did exercise at least once per week was 5.2 (95% CI: 3.1–8.9)

for all subjects, 4.9 (95% CI: 1.8–13) for those with non-acutely life-threatening

conditions, and 4.7 (95% CI: 2.3–9.6) for those who had an acutely life-threatening

condition (p <0.001 for all comparisons) (Table 3).


**Smoking and mortality risk**

Current smoking was reported by 17% of subjects, including 17% who survived

versus 19% who died over the 5-year period (p=0.61) (Table 2).  Among those with no

condition or no acutely life-threatening condition, 19% were smokers, including 18%

who survived versus 28% who died (p=0.27).  Among those who had acutely life-

threatening conditions, 13% were smokers, including 12% who survived versus 15%

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who died (p = 0.59).  Among all subjects, people who smoked at baseline had a 4.6-fold

higher hazard ratio (95% CI: 2.5–8.6) to die within 5 years compared to nonsmokers (p

<0.001), including a hazard ratio of 7.4 (95% CI: 2.1–25) among people with a condition

that was not acutely life-threatening, and 3.3 (95% CI: 1.5–7.3) among those who had

an acutely life-threatening condition (Table 3).

**Multivariate Cox regression analyses**

The four variables studied are not independent, and multivariate regression

analyses were performed (Table 4).  In the entire cohort, physical function, exercise and

current smoking were each significant independent predictors of 5-year mortality, while

pain was not significant, i.e., explained by the other variables (Table 4).  In individuals

younger than age 55 who had no acutely life-threatening condition, pain and smoking

were significant independent predictors of mortality, and physical function and exercise

were not significant; no medical history variable was significant in multivariate analyses.

In individuals 55 years old and older who had no acutely life-threatening condition,

functional status was the only significant predictor of mortality, whereas both functional

status and lack of exercise (but not pain or smoking) were independent statistically

significant predictors in individuals over age 55 who had an acutely life-threatening

condition (Table 4).

**DISCUSSION**

The data presented in this report confirm and extend a large number of reports,

(only a few of which are cited here) that poor physical function,[1-7] pain,[3, 8-10] limited

exercise,[11, 12] and smoking[14] predict premature mortality.  Smoking[14] and limited

exercise[11, 12, 23] are more widely recognized as predictors of premature death than poor

physical function[2, 7] and pain.[3, 9, 10]  Nonetheless, these four medical history variables

are usually not collected in everyday medical care – even smoking status often remains

unknown,[24] although some evidence of improvement has been reported.[25]

The new information here is that these medical history data can be collected

easily in a 1-page (2-sided) MDHAQ-type self-report format (Figure 1), which is easily

completed by patients while waiting to see a health professional.[17]  A version of this

questionnaire has been incorporated into the infrastructure of the authors' usual clinical

care[26] and many other settings.  Collection of these data involves no additional effort on

the part of a physician or an assistant, and can be adapted to any clinical, health

maintenance or research setting.

In the reported cohort of 1,523 older people from the general Finnish population,

survival was 93% in subjects who reported poor physical function and limited exercise,

compared to 95% in smokers, 97% in those who reported pain, and 91% in those who

reported hypertension, versus 98-99% in other subjects.  It could be suggested that one

or more of the four patient history variables, which are correlated with one another,

might not be necessary in clinical care.  However, clinical care of individual patients

necessarily addresses multiple variables that might be correlated significantly – e.g.,

blood pressure, cholesterol, glucose – with evidence that each may contribute to a poor

outcome.  The data establish that each of these variables identifies a potentially

modifiable important indicator of higher mortality risk in affected subjects.

The four medical history risk factors for mortality – poor physical function, pain, limited exercise and smoking – may be regarded as "vital signs" in care of chronic diseases and health maintenance. These "vital signs" are analogous to traditional vital signs in acute care, such as pulse and temperature. Pain[27, 28] and smoking status[14] have been advocated as "vital signs,"[13] introducing a concept that a vital sign may be derived from a medical history, rather than from physical examination. Vital signs often confirm impressions of the clinician, but provide standard quantitative data which may be monitored from one encounter to another more accurately than through narrative descriptions.

Vital signs that identify risk of premature mortality may provide data to analyze whether interventions to improve values of variables such as physical function or pain will improve survival, as seen for exercise, smoking, blood pressure, and cholesterol. It may also be desirable to include these medical history variables in research and clinical analyses of any risk factor for long-term mortality, to ascertain the extent to which they may modify biomedical, genetic and physiologic risk factors in prediction of long-term mortality.

Poor physical function has been characterized extensively as a predictor of long-term mortality.[2, 7] In patients with rheumatoid arthritis, physical function in the format of the questionnaire in this study is as significant as or more significant than radiographic scores or laboratory tests to predict mortality over 5-15 years.[1, 3, 7] Poor functional status also has been reported to predict mortality in patients with congestive heart failure as strongly as ejection fraction,[4] in patients with AIDS as strongly as T4/T8 lymphocyte ratios,[5] in elderly patients,[6] and in the general population over 2 years.[7]

Pain is one of the primary reasons people seek medical care,[29] and is regarded as a marker for conditions that predispose to mortality, including cardiovascular disease and cancer.[10] In this study, the relative risk of death according to pain (as well as the other three patient self-report measures) was explained only in small part by the presence of acutely life-threatening diseases, and was considerably higher in individuals who reported no acutely life-threatening disease. Previous reports also have indicated that high levels of pain predict premature mortality independent of disease,[3,9,10] as was found in the present study. Furthermore, quantitation of pain on a simple visual analog scale (VAS) can improve accuracy of assessment and monitoring of pain in any condition.

Physical exercise in prevention of long-term mortality has been characterized extensively in the literature.[11, 12, 23] Physiologic measures may provide more accurate prediction of mortality than self-report,[23] but the expense of collecting self-report data is considerably lower than a physiologic measure. Exercise appears salutary for all human beings, but patient exercise frequency is not obtained regularly at most physician encounters.

As noted, smoking is widely recognized as a predictor of premature mortality,[14] yet physicians often do not include a query about smoking.[24] Smoking cessation appears more a result of extensive public-health efforts than attributable to medical care, though physicians' reminders have been moderately successful.[15] Physician and public health interventions regarding physical function, pain and exercise, to a similar extent as smoking cessation efforts, could be as effective in promoting health as pharmacologic interventions for recognized risk factors such as hypertension or hyperlipidemia.

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Several limitations are seen to this study.  No laboratory tests were available – it might be of considerable interest to compare these medical history variables with laboratory tests, such as serum cholesterol, in the prognosis of mortality, and whether a component of the risk may be explained by one or more of the reported medical history variables.  All subjects were from Finland, although most data suggest that mortality experience in Finland is similar to that found in most Western countries, and reports from many countries have indicated that each of these variables is prognostic of premature mortality.  Diagnoses were available only from self-report, which can be inaccurate for certain diagnoses.[30]  Nonetheless, most of the excess risk according to these medical history variables was not seen in patients with acutely life-threatening diseases, which ironically may be over-reported in many situations.

In conclusion, risk factors for premature mortality from a medical history – including physical dysfunction, pain, limited exercise, and smoking – may be assessed in a standard systematic format on a simple patient self-report questionnaire.  This questionnaire can be used at any visit in usual care, health maintenance, and clinical research.  More information concerning possible modification of these risk factors through therapeutic intervention could advance the quality of life and longevity in many individuals, and general public health in populations.


**Authors' statement of contributions:**

**Design:** Sokka and Pincus

**Supervision of Data Collection:** Sokka

**Analyses:** Sokka and Pincus

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**Preparation of manuscript:** Pincus and Sokka

**Competing interest:** Dr. Sokka and Dr. Pincus report no competing interest.

**Ethics approval:** The study was approved by the Ethics Committees of Jyväskylä Central Hospital and Population Register Centre of Finland.

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**Table 1.** Prevalence of conditions in older general population. Baseline scores for pain and functional capacity on health assessment questionnaire (HAQ), according to status at 5 years.

| Condition | N | % | Mean Age | % who died over 5 years |
|---|---|---|---|---|
| **Reported acutely life-threatening condition** | | | | |
| Chronic leg ulcer | 3 | 0.2% | 78 | 33% |
| Stroke | 16 | 1.0% | 71 | 31% |
| Chronic kidney disease | 10 | 0.7% | 64 | 30% |
| Chronic bronchitis | 17 | 1.1% | 71 | 29% |
| Other heart disease | 146 | 9.6% | 69 | 23% |
| Diabetes | 103 | 6.8% | 65 | 23% |
| Cancer | 74 | 4.9% | 67 | 22% |
| Coronary artery disease | 135 | 8.9% | 73 | 19% |
| **Reported non-acutely life-threatening condition** | | | | |
| Rheumatoid arthritis | 58 | 3.8% | 68 | 17% |
| Other neurologic disease | 31 | 2.0% | 65 | 16% |
| Parkinson's disease | 7 | 0.5% | 70 | 14% |
| Alcoholism | 18 | 1.2% | 52 | 11% |
| Epilepsy | 10 | 0.7% | 57 | 10% |
| Osteoarthritis | 370 | 24% | 66 | 10% |
| Peptic ulcer | 67 | 4.4% | 62 | 10% |
| Psychiatric disease | 61 | 4.0% | 54 | 9.8% |
| Musculoskeletal trauma | 182 | 11.9% | 58 | 9.3% |
| Thyroid disease | 99 | 6.5% | 64 | 9.1% |
| Hypertension | 454 | 30% | 62 | 8.8% |
| Chronic back pain | 373 | 25% | 59 | 7.2% |
| Ankylosing spondylitis | 14 | 0.9% | 59 | 7.1% |
| Psoriasis | 26 | 1.7% | 55 | 3.8% |
| Asthma | 130 | 8.5% | 59 | 3.1% |
| Fibromyalgia | 56 | 3.7% | 57 | 1.8% |
| Inflammatory gut disease | 19 | 1.2% | 60 | 0 |
| **No reported conditions** | **429** | **28%** | **47** | **1.9%** |

**Table 2.** Mean (standard deviation) values for age, physical function and pain, and

percentage of patients who exercise rarely or smoke, according to type of condition and

vital status 5 years after baseline.

| | All subjects | With no acutely life-threatening condition or no condition | With acutely life-threatening condition |
|---|---|---|---|
| **Age in years** | | | |
| Total | 55 (15) | 52 (13) | 67 (14) |
| Alive | 54 (14) | 51 (13) | 65 (13) |
| Dead | 75 (13) | 69 (15) | 77 (12) |
| p value | <0.001 | <0.001 | <0.001 |
| **Physical function (0-3)** | | | |
| Total | 0.27 (0.60) | 0.16 (0.50) | 0.63 (0.86) |
| Alive | 0.20 (0.46) | 0.13 (0.35) | 0.45 (0.68) |
| Dead | 1.4 (1.1) | 1.1 (1.2) | 1.5 (1.1) |
| p value | <0.001 | <0.001 | <0.001 |
| **Pain (0-100)** | | | |
| Total | 20 (24) | 16 (21) | 34 (29) |
| Alive | 19 (24) | 16 (21) | 32 (28) |
| Dead | 38 (30) | 27 (27) | 43 (29) |
| p value | <0.001 | 0.015 | <0.008 |
| **Exercise <once per week** | | | |
| Total | 28.4% | 24.8% | 40.3% |
| Alive | 25.8% | 24.0% | 32.5% |
| Dead | 75.9% | 62.5% | 81.8% |
| p value | <0.001 | <0.001 | <0.001 |
| **Current smoker at baseline** | | | |
| Total | 17.1% | 18.5% | 12.8% |
| Alive | 17.0% | 18.3% | 12.4% |
| Dead | 19.2% | 28.0% | 15.1% |
| p value | 0.61 | 0.21 | 0.59 |

**Table 3.** Hazard ratios (95% CI) for 5-year mortality in older general population – analyses adjusted for age and sex.

**All subjects**

| | % of subjects with poor status | HR (95% CI) | p value* |
|---|---|---|---|
| Physical function ≥1.0 (vs <1.0) | 10% | 3.5 (2.1 to 5.7) | <0.001 |
| Pain >40 (vs ≤40) | 20% | 2.2 (1.3 to 3.5) | 0.002 |
| Exercise <1 time/week (vs ≥1 time/week) | 28% | 5.2 (3.1 to 8.9) | <0.001 |
| Current smoking (vs not smoking) | 17% | 4.6 (2.5 to 8.6) | <0.001 |

**Subjects with no acutely life-threatening conditions**

| | % of subjects with poor status | HR (95% CI) | p value* |
|---|---|---|---|
| Physical function ≥1.0 (vs <1.0) | 5% | 4.5 (1.6 to 13) | 0.004 |
| Pain >40 (vs ≤40) | 14% | 3.1 (1.2 to 8.3) | 0.024 |
| Exercise <1 time/week (vs ≥1 time/week) | 25% | 4.9 (1.8 to 13) | 0.001 |
| Current smoking (vs not smoking) | 18% | 7.4 (2.1 to 25) | 0.002 |

**Subjects with acutely life-threatening condition**

| | % of subjects with poor status | HR (95% CI) | p value* |
|---|---|---|---|
| Physical function ≥1.0 (vs <1.0) | 25% | 3.1 (1.8 to 5.5) | <0.001 |
| Pain >40 (vs ≤40) | 40% | 1.5 (0.9 to 2.8) | 0.16 |
| Exercise <1 time/week (vs ≥1 time/week) | 40% | 4.7 (2.3 to 9.6) | <0.001 |
| Current smoking (vs not smoking) | 13% | 3.3 (1.5 to 7.3) | 0.003 |

* adjusted for age and sex

**Table 4.** Multivariate model: Hazard ratios (95% CI) for 5-year mortality

| All individuals | HR (95% CI) |
|---|---|
| Physical function ≥1.0 (vs <1.0) | 2.6 (1.3 to 5.1) |
| Pain >40 (vs ≤40) | 0.8 (0.4 to 1.5) |
| Exercise <1 time/week (vs ≥1 time/week) | 3.2 (1.7 to 6.1) |
| Current smoking (vs not smoking) | 4.9 (2.2 to 11) |
| **Subjects less than 55 years old** | **HR (95% CI)** |
| Physical function ≥1.0 (vs <1.0) | 0 |
| Pain >40 (vs ≤40) | 4.8 (1.1 to 20) |
| Exercise <1 time/week (vs ≥1 time/week) | 4.9 (1.8 to 13) |
| Current smoking (vs not smoking) | 7.4 (2.1 to 25) |
| **Subjects age 55 and older** | **HR (95% CI)** |
| Physical function ≥1.0 (vs <1.0) | 2.2 (1.1 to 4.7) |
| Pain >40 (vs ≤40) | 1.1 (0.6 to 2.0) |
| Exercise <1 time/week (vs ≥1 time/week) | 3.1 (1.5 to 6.6) |
| Current smoking (vs not smoking) | 3.9 (1.2 to 12) |

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**FIGURE LEGENDS**

**Figure 1.** Multidimensional health assessment questionnaire (MDHAQ). The front page **(A)** includes 10 activities for function, two visual analog scales (VAS) for pain and patient global estimate of status, and a self-report joint count from a rheumatoid arthritis disease activity index (RADAI). Scoring templates for these measures are available on the right-hand side of the page. An index of the three patient-reported measures, routine assessment of patient index data (RAPID3), can be calculated from an MDHAQ in fewer than 10 seconds. The reverse side **(B)** includes a review of systems, fatigue visual analog scale (VAS), recent medical history, queries about change in global status and frequency of exercise, and demographic data (not included in scoring, but providing useful data in clinical care).

**Figure 2.** Kaplan Meier survival for mortality according to **A)** functional capacity (HAQ ≥1 vs. <1), **B)** pain (>4.0 vs. ≤4.0), **C)** frequency of physical exercise and **D)** smoking status, over 5 years.

## Multi-Dimensional Health Assessment Questionnaire (R808-NP2)

This questionnaire includes information not available from blood tests, X-rays, or any source other than you. Please try to answer each question, even if you do not think it is related to you at this time. Try to complete as much as you can yourself, but if you need help, please ask. <u>There are no right or wrong answers.</u> Please answer exactly as you think or feel. Thank you.

**1. Please check (√) the ONE best answer for your abilities at this time:**

| OVER THE LAST WEEK, were you able to: | Without ANY Difficulty | With SOME Difficulty | With MUCH Difficulty | UNABLE To Do |
|---|---|---|---|---|
| a. Dress yourself, including tying shoelaces and doing buttons? | 0 | 1 | 2 | 3 |
| b. Get in and out of bed? | 0 | 1 | 2 | 3 |
| c. Lift a full cup or glass to your mouth? | 0 | 1 | 2 | 3 |
| d. Walk outdoors on flat ground? | 0 | 1 | 2 | 3 |
| e. Wash and dry your entire body? | 0 | 1 | 2 | 3 |
| f. Bend down to pick up clothing from the floor? | 0 | 1 | 2 | 3 |
| g. Turn regular faucets on and off? | 0 | 1 | 2 | 3 |
| h. Get in and out of a car, bus, train, or airplane? | 0 | 1 | 2 | 3 |
| i. Walk two miles or three kilometers, if you wish? | 0 | 1 | 2 | 3 |
| j. Participate in recreational activities and sports as you would like, if you wish? | 0 | 1 | 2 | 3 |
| k. Get a good night's sleep? | 0 | 1.1 | 2.2 | 3.3 |
| l. Deal with feelings of anxiety or being nervous? | 0 | 1.1 | 2.2 | 3.3 |
| m. Deal with feelings of depression or feeling blue? | 0 | 1.1 | 2.2 | 3.3 |

**FOR OFFICE USE ONLY**

1.a-j FN (0-10): ☐

| | |
|---|---|
| 1=0.3 | 16=5.3 |
| 2=0.7 | 17=5.7 |
| 3=1.0 | 18=6.0 |
| 4=1.3 | 19=6.3 |
| 5=1.7 | 20=6.7 |
| 6=2.0 | 21=7.0 |
| 7=2.3 | 22=7.3 |
| 8=2.7 | 23=7.7 |
| 9=3.0 | 24=8.0 |
| 10=3.3 | 25=8.3 |
| 11=3.7 | 26=8.7 |
| 12=4.0 | 27=9.0 |
| 13=4.3 | 28=9.3 |
| 14=4.7 | 29=9.7 |
| 15=5.0 | 30=10 |

2.PN (0-10): ☐

**2. How much pain have you had because of your condition OVER THE PAST WEEK?**
   Please indicate below how severe your pain has been:

NO ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ PAIN AS BAD AS
PAIN   0   0.5   1.0   1.5   2.0   2.5   3.0   3.5   4.0   4.5   5.0   5.5   6.0   6.5   7.0   7.5   8.0   8.5   9.0   9.5   10   IT COULD BE

4.PTGL (0-10): ☐

RAPID 3 (0-30): ☐

**3. Please place a check (√) in the appropriate spot to indicate the amount of pain you are having today in each of the joint areas listed below:**

| | None | Mild | Moderate | Severe | | None | Mild | Moderate | Severe |
|---|---|---|---|---|---|---|---|---|---|
| a. LEFT FINGERS | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | i. RIGHT FINGERS | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 |
| b. LEFT WRIST | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | j. RIGHT WRIST | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 |
| c. LEFT ELBOW | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | k. RIGHT ELBOW | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 |
| d. LEFT SHOULDER | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | l. RIGHT SHOULDER | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 |
| e. LEFT HIP | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | m. RIGHT HIP | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 |
| f. LEFT KNEE | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | n. RIGHT KNEE | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 |
| g. LEFT ANKLE | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | o. RIGHT ANKLE | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 |
| h. LEFT TOES | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | p. RIGHT TOES | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 |
| q. NECK | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | r. BACK | ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 |

Cat:

HS = >12

MS = 6.1-12

LS = 3.1-6

R = <u><</u>3

**4. Considering all the ways in which illness and health conditions may affect you at this time, please indicate below how you are doing:**

VERY ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ VERY
WELL   0   0.5   1.0   1.5   2.0   2.5   3.0   3.5   4.0   4.5   5.0   5.5   6.0   6.5   7.0   7.5   8.0   8.5   9.0   9.5   10   POORLY

### Please turn to the other side

**Figure 1A**

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5. Please check (√) if you have experienced any of the following <u>over the last month:</u>

| | | | |
|---|---|---|---|
| ___Fever | ___Lump in your throat | ___Paralysis of arms or legs | |
| ___Weight gain (>10 lbs) | ___Cough | ___Numbness or tingling of arms or legs | **FOR OFFICE USE ONLY** |
| ___Weight loss (>10 lbs) | ___Shortness of breath | ___Fainting spells | |
| ___Feeling sickly | ___Wheezing | ___Swelling of hands | **5. ROS:** |
| ___Headaches | ___Pain in the chest | ___Swelling of ankles | |
| ___Unusual fatigue | ___Heart pounding (palpitations) | ___Swelling in other joints | |
| ___Swollen glands | ___Trouble swallowing | ___Joint pain | |
| ___Loss of appetite | ___Heartburn or stomach gas | ___Back pain | |
| ___Skin rash or hives | ___Stomach pain or cramps | ___Neck pain | |
| ___Unusual bruising or bleeding | ___Nausea | ___Use of drugs not sold in stores | |
| ___Other skin problems | ___Vomiting | ___Smoking cigarettes | |
| ___Loss of hair | ___Constipation | ___More than 2 alcoholic drinks per day | |
| ___Dry eyes | ___Diarrhea | ___Depression - feeling blue | |
| ___Other eye problems | ___Dark or bloody stools | ___Anxiety - feeling nervous | |
| ___Problems with hearing | ___Problems with urination | ___Problems with thinking | |
| ___Ringing in the ears | ___Gynecological (female) problems | ___Problems with memory | |
| ___Stuffy nose | ___Dizziness | ___Problems with sleeping | |
| ___Sores in the mouth | ___Losing your balance | ___Sexual problems | |
| ___Dry mouth | ___Muscle pain, aches, or cramps | ___Burning in sex organs | |
| ___Problems with smell or taste | ___Muscle weakness | ___Problems with social activities | |

Please check (√) here if you have had none of the above over the last month: _____.

6. **When you awakened in the morning OVER THE LAST WEEK, did you feel stiff?** ☐ **No**    ☐ **Yes**
If "No," please go to Item 7.  If "**Yes**," please indicate the number of minutes_____, or hours _____
until you are as limber as you will be for the day.

7. **How do you feel TODAY compared to ONE WEEK AGO?  Please check (✓) only one.**
**Much Better** ☐ (1),   **Better** ☐ (2),   the **Same** ☐ (3),   **Worse** ☐ (4),   **Much Worse** ☐ (5) than one week ago

8. **How often do you exercise aerobically** (sweating, increased heart rate, shortness of breath) **for at least one-half hour (30 minutes)?** Please check (✓) only one.
☐ 3 or more times a week (3)   ☐ 1-2 times per month (1)
☐ 1-2 times per week    (2)   ☐ Do not exercise regularly (0)   ☐ Cannot exercise due to disability/ handicap (9)

9. **How much of a problem has UNUSUAL fatigue or tiredness been for you OVER THE PAST WEEK?**

FATIGUE IS   O O O O O O O O O O O O O O O O O O O O O   FATIGUE IS A
NO PROBLEM   0  0.5  1.0  1.5  2.0  2.5  3.0  3.5  4.0  4.5  5.0  5.5  6.0  6.5  7.0  7.5  8.0  8.5  9.0  9.5  10   MAJOR  PROBLEM

10. **Over the last 6 months have you had: [Please check (√)]**

| | | | |
|---|---|---|---|
| ☐No ☐Yes An operation or new illness | | ☐No ☐Yes Change(s) of arthritis or other medication | |
| ☐No ☐Yes Medical emergency or stay overnight in hospital | | ☐No ☐Yes Change(s) of address | |
| ☐No ☐Yes A fall, broken bone, or other accident or trauma | | ☐No ☐Yes Change(s) of marital status | |
| ☐No ☐Yes An important new symptom or medical problem | | ☐No ☐Yes Change job or work duties, quit work, retired | |
| ☐No ☐Yes Side effect(s) of any medication or drug | | ☐No ☐Yes Change of medical insurance, Medicare, etc. | |
| ☐No ☐Yes Smoke cigarettes regularly | | ☐No ☐Yes Change of primary care or other doctor | |

Please explain any "Yes" answer below, or indicate any other health matter that affects you:

_____

_____

**SEX:** ☐ Female, ☐ Male  **ETHNIC GROUP:** ☐ Asian,  ☐ Black,  ☐ Hispanic,  ☐ White, ☐ Other_____

**Your Occupation** _____  Please circle the number of years of school you have completed:
**Work Status:** ☐ Full-time, ☐ Part-time, ☐ Disabled     1   2   3   4   5   6   7   8   9  10
☐ Homemaker, ☐ Self-Employed, ☐Retired,              11  12  13  14  15  16  17  18  19  20
☐ Seeking work, ☐ Other_____  Please write your weight: _____ lbs.  height: _____ inches

**Your Name_____ Date of Birth _____  Today's Date _____**

**Page 2 of 2  Thank you for completing this questionnaire to help keep track of your medical care.   R808NP2**

**FOR OFFICE USE ONLY:** I have reviewed the questionnaire responses.
Date: _____     Signature_____
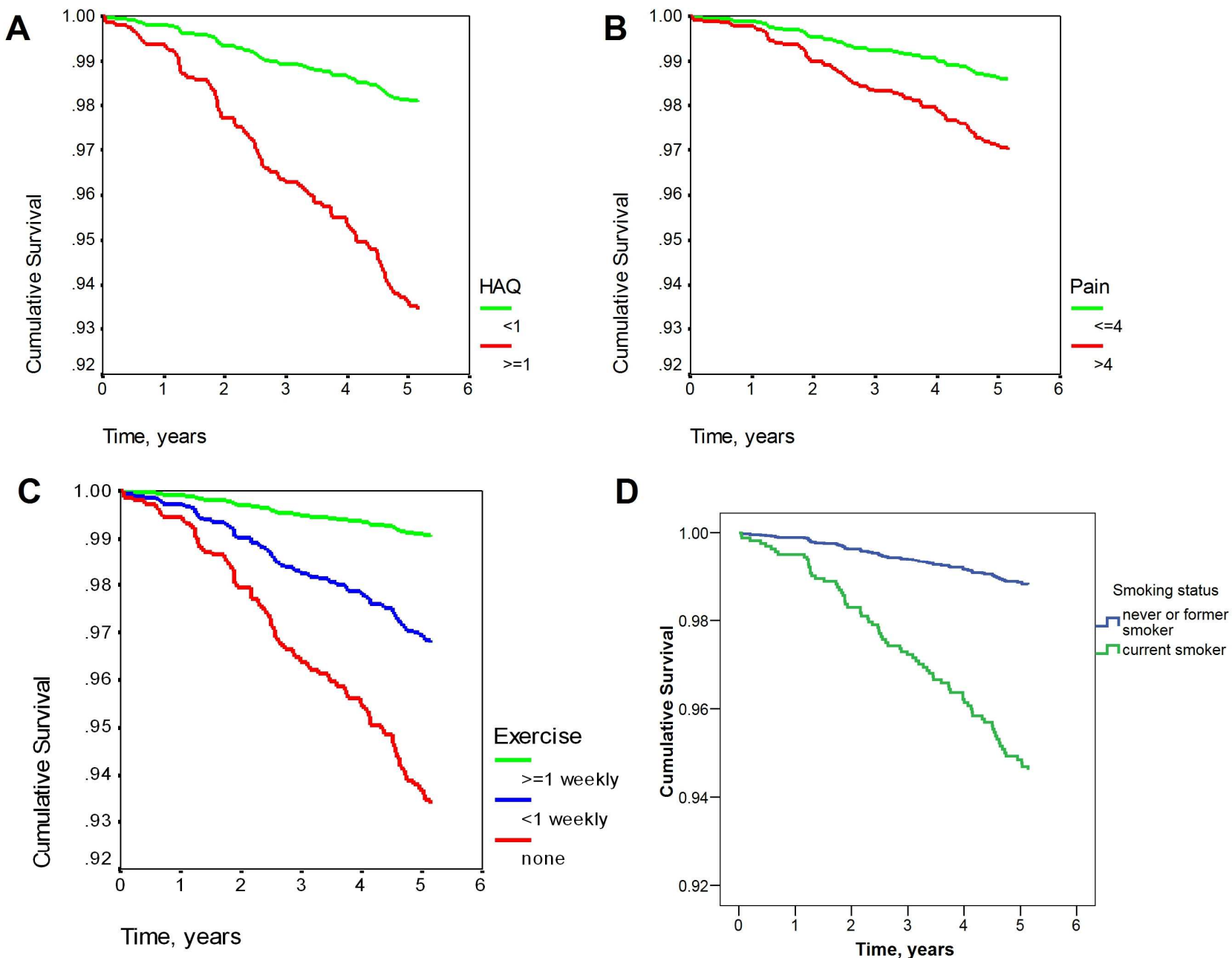
**Figure 1B**

**Figure 2.** Kaplan Meier survival for mortality according to **A)** functional capacity (HAQ ≥1 vs. <1), **B)** pain (>4.0 vs. ≤4.0), **C)** frequency of physical exercise and **D)** smoking status, over 5 years.

**STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies***

| Section/Topic | Item # | Recommendation | Reported on page # |
|---|---|---|---|
| **Title and abstract** | 1 | (*a*) Indicate the study's design with a commonly used term in the title or the abstract | 2 |
| | | (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found | 2 |
| **Introduction** | | | |
| Background/rationale | 2 | Explain the scientific background and rationale for the investigation being reported | 5 |
| Objectives | 3 | State specific objectives, including any prespecified hypotheses | 5 |
| **Methods** | | | |
| Study design | 4 | Present key elements of study design early in the paper | 5-7 |
| Setting | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection | 6 |
| Participants | 6 | (*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up | 6 |
| | | (*b*) For matched studies, give matching criteria and number of exposed and unexposed | 6 |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable | 6 |
| Data sources/ measurement | 8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group | 6 |
| Bias | 9 | Describe any efforts to address potential sources of bias | 6 |
| Study size | 10 | Explain how the study size was arrived at | 6 |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why | 7 |
| Statistical methods | 12 | (*a*) Describe all statistical methods, including those used to control for confounding | 7-8 |
| | | (*b*) Describe any methods used to examine subgroups and interactions | 7-8 |
| | | (*c*) Explain how missing data were addressed | NA |
| | | (*d*) If applicable, explain how loss to follow-up was addressed | 7 |
| | | (*e*) Describe any sensitivity analyses | NA |
| **Results** | | | |
| Participants | 13* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed | 5 |

| | | | |
|---|---|---|---|
| | | eligible, included in the study, completing follow-up, and analysed | |
| | | (b) Give reasons for non-participation at each stage | 5 |
| | | (c) Consider use of a flow diagram | NA |
| Descriptive data | 14* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders | 8 |
| | | (b) Indicate number of participants with missing data for each variable of interest | NA |
| | | (c) Summarise follow-up time (eg, average and total amount) | 8 |
| Outcome data | 15* | Report numbers of outcome events or summary measures over time | 8 |
| Main results | 16 | (*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included | 8 |
| | | (*b*) Report category boundaries when continuous variables were categorized | 8 |
| | | (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period | 9-11 |
| Other analyses | 17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses | 9-11 |
| **Discussion** | | | |
| Key results | 18 | Summarise key results with reference to study objectives | 3, 12-13 |
| **Limitations** | | | |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence | 4, 12-13 |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results | 14 |
| **Other information** | | | |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based | 17 |

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

**Poor physical function, pain, and limited exercise: Risk factors for premature mortality in the range of smoking or hypertension, identified on a simple patient self-report questionnaire for usual care**

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Manuscripts

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**Poor physical function, pain, and limited exercise: Risk factors for**

**premature mortality in the range of smoking or hypertension,**

**identified on a simple patient self-report questionnaire for usual care**

**Tuulikki Sokka[1], Theodore Pincus[2]**


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**ABSTRACT (250 words)**

**Objective:** To analyze poor physical function, pain, limited exercise and smoking, assessed in a patient-friendly self-report questionnaire format that has been completed by every patient at every visit over 20-30 years in the authors' and other usual care settings, to predict 5-year mortality in a general older population.

**Methods:** An extended version of a Multidimensional Health Assessment Questionnaire (MDHAQ) was mailed to 2000 subjects in Finland, identified as a randomly-selected control cohort for a rheumatoid arthritis cohort. The questionnaire included queries concerning baseline physical function, pain, exercise and smoking status, identical to the clinic version, as well as age and 25 medical conditions. Five-year survival was analyzed according to descriptive statistics, Kaplan-Meier curves and Cox regressions.

**Results:** The questionnaire was returned by 1,523 subjects (76%). Five-year survival was 94% in all subjects, 98% in subjects with no disease or no acutely life-threatening disease, and 17% in subjects with an acutely life-threatening disease. Hazard ratios for 5-year mortality were 3.5 for poor physical function, 2.2 for pain, 5.2 for limited exercise, and 4.6 for smoking (p<0.01); 5-year survivals were 93%, 97%, 93% and 95%, respectively, compared to 91% for hypertension. Each of the four patient history variables predicted mortality at higher levels in subjects who reported <u>no</u> versus one or more acutely life-threatening conditions.

**Conclusions:** Poor physical function, pain, limited exercise, and smoking can be assessed systematically on a simple standard MDHAQ, to identify potentially modifiable risk factors for premature mortality in the infrastructure of usual medical care and health maintenance.

**ARTICLE SUMMARY**

**Article focus:**

- A simple, one-page patient self-report questionnaire to assess systematically physical function, pain, and limited exercise, and smoking has been completed by all patients at all visits in 5-10 minutes in routine care in several rheumatology clinical settings for 20-30 years, including those of the authors,.

- Responses on this questionnaire indicating poor physical function, pain, and limited exercise have been documented as significant prognostic markers for premature mortality in patients with rheumatoid arthritis (RA), with greater significance than radiographs or laboratory tests.

- Questionnaire responses in an older cohort from the general population, identified from a population register as a control cohort for a rheumatoid arthritis cohort, indicated that poor physical function, pain, and limited exercise also predicted 5-year mortality significantly, in the range of smoking and hypertension.

**Key messages:**

- Poor physical function, pain, and limited exercise are potentially modifiable risk factors for premature mortality in the general population, in a similar range as smoking and hypertension.

- A systematic assessment of these patient history variables is not included at most medical visits, in contrast to blood pressure or serum cholesterol, in part as most available questionnaire formats appear to add to the burden of care for patients and doctors.

- Scores in a simple format on a questionnaire which is completed by patient self-report in 5-10 minutes provide quantitative data concerning physical function, pain, exercise status, and smoking as significant risk factors for mortality, with virtually no additional work on the part of a health professional, to ensure that data are available for clinical review.

- Poor physical function, pain, and limited exercise are more significant in prognosis of death over 5 years in individuals who do <u>not</u> versus do report one or more potentially acutely life-threatening diseases.

## <u>Strengths and limitations of this study</u>:

### *Strengths:*

- Population-based subjects

- Survey returned by 1,523 of 2,000 subjects (76%)

- Questionnaire easily completed by patient self-report in 5-10 minutes in any clinical or research setting, or even at home

### *Limitations***:**

- No laboratory tests were available – it would be of interest to compare medical history variables with laboratory tests, such as serum cholesterol, in the prognosis of mortality, and whether a component of the risk according to the laboratory test may be "explained" in part by a patient history measure.

- All subjects were from Finland, although most data suggest that mortality experience in Finland is similar to that found in most Western countries, and reports from other countries have indicated that poor physical function, pain and limited exercise are prognostic of premature mortality.  Furthermore, a response

rate of >75% from the general population might be unlikely in most countries, and may be unique to Finland.

- Diagnoses were available only from self-report, which can be inaccurate for certain diagnoses. However, the excess risk according to poor physical function, pain, and limited exercise was greater in subjects who reported no versus any acutely life-threatening diseases.

- Actual survey includes more queries, and is not identical to that used in clinical settings, although actual queries about 4 risk factors are identical in clinical and study format.

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**INTRODUCTION**

Poor physical function[1-7], pain [3, 8-10], limited exercise [11, 12], and smoking [13, 14] each are potentially-modifiable significant risk factors for mortality derived from a medical history.  However, these risk factors generally are not assessed systematically or even available at most patient visits in usual medical care and health promotion settings [13, 15]. By contrast, blood pressure and serum cholesterol are recorded carefully at most visits in contemporary routine care settings and health maintenance, although the patient-history-derived variables may be in a similar range as risk factors for mortality.

One reason that patient history variables are not available in most care settings may be that reported data generally have been collected in complex, non-standard formats, which add to the burden of usual care.  Therefore, a simple format for systematic collection of data concerning physical function, pain, exercise status, and smoking in the infrastructure of usual care, with minimal additional effort on the parts of patients and health professionals, could provide a useful advance.

A simple, two-sided/one-page multidimensional health assessment questionnaire (MDHAQ) [16, 17] (Figure 1) has been completed at every visit of every patient for 20-30 years in clinical settings of the authors, as well as other rheumatology clinical settings over many years [18-21].  This questionnaire is readily accepted by patients, and completed in 5–10 minutes while waiting to see the doctor [21].  Responses to MDHAQ queries concerning physical function, pain, exercise status, and smoking are prognostic of premature mortality in patients with rheumatoid arthritis (RA) [22].  Since the MDHAQ format could facilitate availability of the information to any health professional caring for any individual patient, it appeared of interest to analyze whether responses concerning

these variables on this simple questionnaire (in contrast to lengthy questionnaires used in research studies) would be prognostic of 5-year mortality in the general population.

A cohort of 1,523 individuals from a normal older Finnish population had been assembled as a "control group" to be monitored over long periods in comparison with a cohort of RA patients [7, 23, 24]. These individuals had completed a questionnaire with MDHAQ queries (used in usual clinical care) for quantitative physical function, pain, exercise frequency and smoking. An earlier report indicated that scores for physical function, but not for pain, were prognostic for mortality 2 years later in this cohort, but the data did not include exercise status and were not adjusted for specific comorbidities, including the presence of acutely life-threatening diseases [7]. In this report, we present analyses of 5-year survival according to baseline physical function, pain, exercise status, smoking and disease data collected on this questionnaire, in this randomly-identified older Finnish population.

**METHODS**

**Subjects**

The subjects were 1,523 older individuals identified in the general population of the Central Finland District. Initially, in the year 2000, the Finnish Population Register Centre identified 2,000 individuals from the general population as a "control" population for a cohort of 1,500 patients with rheumatoid arthritis who are being monitored for long-term outcomes [23]. The cohort was designed to include 70% females, with mean age of 55 years, but otherwise was identified randomly from the general population with no selection criteria other than age and sex.

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A self-report questionnaire which included the items in Figure 1 in an identical

format, plus additional items designed for further longitudinal research, was mailed to

the 2,000 older individuals, identified randomly in the general population from the

Finnish Population Register.  The questionnaire was returned by 1,523 subjects (76%).

Earlier reports two years after baseline indicated that functional status was considerably

poorer in age-matched patients with RA than in the general population [23]; that poor

physical function not analyzed according to possible diseases, but not pain, was

associated with increased mortality rates in both RA patients and the general

population[7]; and that significantly higher mortality rates were seen in individuals who did

not return the questionnaire [24].  Five years after the baseline assessment, in September

2005, the vital status of all subjects was ascertained from the Finnish Population

Register.  The study was approved by the Ethics Committees of Jyväskylä Central

Hospital and Population Register Centre of Finland.


**Self-report questionnaire**

The self-report questionnaire mailed to subjects in the general population

included the items on the MDHAQ in Figure 1, and additional queries concerning

diagnoses and demographic data for a research study.  Physical function was queried

on a version of the original Health Assessment Questionnaire (HAQ) [25], which queries

20 activities of daily living, scored 0–3, with a mean overall physical function score of 0–

3; similar results are seen with inclusion of only 10 activities on a MDHAQ [16, 17].  Pain

was assessed on a 10 cm pain visual analog scale (VAS) (0="No pain," 10="Pain as

bad as it could be") derived initially from Huskisson [26].  The frequency of aerobic

exercise was queried with five response options: "≥3 times weekly," "1-2 times weekly,"

"1-2 times monthly," "no exercise," and "cannot exercise because of health conditions."

Smoking status was queried as a response to "Do you smoke cigarettes at this time?"

with simple "Yes/No" response options.  A list of 25 health conditions (Table 1), which is

not included in the MDHAQ for usual clinical care, was included on the study

questionnaire.  Subjects were queried: "Which of the following conditions have you ever

had at any time?" with "Yes/No" response options.  The standard MDHAQ includes date

of birth as well as recent medical history, symptom checklist review of systems, and

other variables in a 2-sided, one-page format [27, 28].

**Statistical analyses**

Data concerning survival of all subjects over 5 years was obtained from the

Finnish Population Register Centre in 2005, and was computed according to self-report

of each individual condition, age, physical function, pain, exercise frequency, and

smoking.  Analyses of mortality according to continuous variables were computed as

median and mean values, and for dichotomous variables as percentages in each

category.  Statistical significance was analyzed according to a t-test and analysis of

covariance for continuous variables and chi-square test for dichotomous variables.

Survival was analyzed for subjects classified into three categories on the basis of

results of the survey: no reported health condition; one or more condition(s) but no

acutely life-threatening condition; and one or more acutely life-threatening condition(s),

as defined by the findings described in Results.  Few deaths occurred in those who

reported no health condition, and further analyses were performed in two categories: no

condition or no acutely life-threatening condition versus one or more acutely life-threatening condition(s).

Kaplan-Meier curves and Cox proportional hazard regression models were computed to analyze time-to-death in subjects according to: *a)* physical function scores (range 0–3)  of <1 versus ≥1, indicating moderate difficulty to perform activities of daily living;  *b)* pain VAS scores (range 0–100) of ≤40 versus >40, indicating moderate pain; *c)* frequency of physical exercise of "1 or more times weekly" versus "less than once weekly"; *d)* current smoking status, analyzed as yes or no.  Multivariate models were analyzed for physical function and pain as continuous variables, as well as according to clinical cutpoints that could highlight possible severe status, such as physical function of ≥1.0 versus <1 on a scale of 0-3, and pain of >40 versus ≤40 on a 0-100 visual analog scale (VAS).  Certain analyses were stratified according to age, and multivariate computations were adjusted for age, sex, and type of health condition – acutely life-threatening versus non-acutely life-threatening or none.


**Role of the funding source**

No specific funding source was available for these studies.  The authors are solely responsible for the study design; collection, analysis and interpretation of data; writing the report; and a decision to submit the paper for publication.

**RESULTS**

**Overall mortality in the cohort**

The mean age of the 1,523 individuals in the study cohort was 55 years (range 30-91 years), and 72% were females. Among the 1,523 subjects, 92 (6.0%) died over the subsequent 5 years. Eight of 25 health conditions were found associated with 5-year mortality rates of 19% or more, and were classified as "acutely life-threatening diseases," i.e., coronary artery disease, other heart diseases, chronic kidney disease, chronic bronchitis, chronic leg ulcers, diabetes, cancer and stroke. The 17 other conditions with subsequent 5-year mortality rates of 17% or less were classified as "non-acutely life-threatening diseases," i.e., hypertension, peptic ulcer, inflammatory gut disease, asthma, thyroid disease, Parkinson's disease, epilepsy, other neurologic diseases, chronic back pain, fibromyalgia, psoriasis, psychiatric diseases, alcoholism, osteoarthritis, musculoskeletal trauma, rheumatoid arthritis and ankylosing spondylitis.

The 92 deaths included 8 of 429 (1.9%) who had reported no health condition, 21 of 728 (2.9%) with a non-acutely life-threatening condition, and 63 of 366 (17.2%) with one or more acutely life-threatening conditions (Table 1) (some patients had 2 or 3 such conditions, so total mortality was less than 19%). The 8 subjects with no health condition and 21 with no acutely life-threatening conditions were pooled for further mortality analyses as 29 (2.5%) of 1,157 subjects with no condition or no acutely life-threatening condition who died within 5 years. The mean baseline age of all patients who survived or died over the 5-year period was 54 and 75 years, respectively (p <0.001) (Table 2), including 51 and 69 years in subjects with no conditions or no acutely

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life-threatening conditions (p <0.001), and 65 and 77 years in subjects with an acutely

life-threatening condition (p <0.001).

**Survival according to four medical history variables**

Cumulative survival in the entire cohort differed according to physical function

scores: 98% with scores <1 (on a 0-3 scale) survived versus 93% with scores ≥1

(Figure 2). Survival was 99% in those with pain VAS scores ≤4 versus 97% in those

with pain scores >4. Survival was >99% in those who exercised more than once weekly,

97% in those who exercised once weekly, and 93% in those who did not exercise.

Survival was 98% in non-smokers versus 95% in smokers (Figure 2). Further analyses

of survival according to each of the four variables are presented below.

**Physical function scores and mortality risk**

Mean physical function scores were 0.27 (on a scale of 0–3) in all subjects,

including 0.20 in those who survived and 1.4 in those who died over the 5-year period (p

<0.001) (Table 2). In the 1,257 subjects with no conditions or no acutely life-threatening

conditions, mean physical function scores were 0.16, including 0.13 for those who

survived and 1.1 for those who died (p <0.001) (Table 2). In the 366 subjects with

acutely life-threatening conditions, mean physical function scores were 0.63, including

0.45 in those who survived and 1.5 in those who died (p <0.001) (Table 2). The hazard

ratio and 95% confidence interval (CI) for mortality over 5 years for physical function

scores ≥1 (on a scale of 0–3), was 3.5 (95% CI: 2.1–5.1) for all subjects, 4.5 (95% CI:

1.6–12.6) for those with non-acutely life-threatening conditions, and 3.1 (95% CI: 1.8–

5.5) for those with acutely life-threatening conditions (Table 3).

**Pain scores and mortality risk**

The mean pain score was 20 (on a scale of 0–100) in all subjects, including a

mean level of 19 in those who survived compared to 38 in those who died over the next

5 years (p <0.001) (Table 2).  The mean pain score in individuals with no condition or no

acutely life-threatening condition was 16, including 16 in those who survived compared

to 27 in those who died (p = 0.020) (Table 2).  The mean pain score in subjects with an

acutely life-threatening condition was 34, including 32 in those who survived compared

to 43 in those who died over the next 5 years (p = 0.008).  The hazard ratio (with 95%

CI) for mortality over 5 years if pain scores were >40 compared to ≤40 (on a scale of 0–

100) was 2.2 (95% CI: 1.3–3.5) for all subjects (Table 3), 3.1 (95% CI: 1.2–8.3) for

those with non-acutely life-threatening conditions, but 1.5 (95% CI: 0.9–2.8) for those

with acutely life-threatening conditions, not meeting the p<0.05 criterion (p <0.16).

**Exercise frequency and mortality risk**

Among all individuals, 28% exercised less than once per week, including 26% of

those who survived and 76% of those who died over the 5 years (Table 2).  Among

subjects with no conditions or no acutely life-threatening conditions, 25% exercised less

than once per week, including 24% who survived versus 63% who died (Table 2).

Among subjects who had an acutely life-threatening condition, 40% exercised less than

once per week, including 33% who survived and 82% who died.  The hazard ratio (with

95% CI) for death over 5 years among subjects who exercised less than once per week

compared to those who did exercise at least once per week was 5.2 (95% CI: 3.1–8.9)

for all subjects, 4.9 (95% CI: 1.8–13) for those with non-acutely life-threatening

conditions, and 4.7 (95% CI: 2.3–9.6) for those who had an acutely life-threatening

condition (p <0.001 for all comparisons) (Table 3).


**Smoking and mortality risk**

Current smoking was reported by 17% of subjects, including 17% who survived

versus 19% who died over the 5-year period (p=0.61) (Table 2).  Among those with no

condition or no acutely life-threatening condition, 19% were smokers, including 18%

who survived versus 28% who died (p=0.27).  Among those who had acutely life-

threatening conditions, 13% were smokers, including 12% who survived versus 15%

who died (p = 0.59).  Among all subjects, people who smoked at baseline had a 4.6-fold

higher hazard ratio (95% CI: 2.5–8.6) to die within 5 years compared to nonsmokers (p

<0.001), including a hazard ratio of 7.4 (95% CI: 2.1–25) among people with a condition

that was not acutely life-threatening, and 3.3 (95% CI: 1.5–7.3) among those who had

an acutely life-threatening condition (Table 3).


**Multivariate Cox regression analyses**

The four variables studied are not independent, and multivariate regression

analyses were performed (Table 4).  In the entire cohort, physical function, exercise and

current smoking were each significant independent predictors of 5-year mortality, while

pain was not significant, i.e., explained by the other variables (Table 4).  In individuals

younger than age 55 who had no acutely life-threatening condition, pain and smoking

were significant independent predictors of mortality, and physical function and exercise

were not significant; no medical history variable was significant in multivariate analyses.

In individuals 55 years old and older who had no acutely life-threatening condition,

functional status was the only significant predictor of mortality, whereas both functional

status and lack of exercise (but not pain or smoking) were independent statistically

significant predictors in individuals over age 55 who had an acutely life-threatening

condition (Table 4).

**DISCUSSION**

The results confirm and extend a number of reports (only some of which are cited

here) that poor physical function [1-7], pain [3, 8-10], limited exercise [11, 12], and smoking [14]

predict premature mortality. Smoking [14] and limited exercise [11, 12, 29] are more widely

recognized as predictors of premature death than poor physical function [2, 7] and pain [3, 9,

10]. Nonetheless, these four medical history variables usually are not collected in

everyday medical care – even smoking status often remains unknown [30], although some

evidence of improvement has been reported [31]. By contrast, variables from sources

other than the medical history with similar prognostic significance for premature

mortality – such as blood pressure and cholesterol – are collected rigorously in most

clinical care and health maintenance settings.

The new information presented here is that prognostic quantitative data

concerning physical function, pain, exercise status and smoking can be collected in a

format found on a 1-page (2-sided) self-report MDHAQ (Figure 1), which has been

completed by all patients seen by the authors at all visits in the infrastructure of usual

care for 20-30 years [18-21], and in many other settings. This questionnaire is given to

each patient to complete upon registration for a visit and easily completed by patients in

5-10 minutes, so that collection of the medical history variables involves no additional

effort on the part of a health professional or office staff.[32]  The MDHAQ can be adapted

to any clinical, health maintenance, or research setting, and can be completed at home.

In the reported cohort of 1,523 older people from the general Finnish population,

survival was 93% in subjects who reported poor physical function or limited exercise,

compared to 95% in smokers, 97% in those who reported pain, and 91% in those who

reported hypertension, versus 98-99% in other subjects.  It could be suggested that one

or more of the four patient history variables, which are correlated with one another,

might not be necessary in clinical care.  However, clinical care of individual patients

necessarily addresses multiple variables that might be correlated significantly but may

each contribute incrementally to a poor outcome – e.g., blood pressure, cholesterol,

glucose [33].  The possible independent contribution of poor physical function, pain, and

limited exercise, as reported in the simple self-report MDHAQ format, to higher mortality

rates remains to be characterized further.

Physical function, pain, exercise status and smoking may be regarded as "vital

signs" from a medical history for chronic diseases and health maintenance, analogous

to traditional vital signs in acute care, such as pulse and temperature.  Pain [34, 35] and

smoking status [14] have been advocated as "vital signs" [13], introducing a concept that a

vital sign may be derived from a medical history, rather than from physical examination.

Vital signs often confirm impressions of the clinician, but also provide standard

quantitative data, which may be regarded as a type of checklist [36, 37] to be monitored

from one encounter to another more accurately than through narrative descriptions.

Vital signs that identify risk of premature mortality may provide data to analyze whether

interventions to improve variables such as physical function or pain will improve survival,

as seen for exercise, smoking, blood pressure, and cholesterol.  It may also be

desirable to include these medical history variables in research and clinical analyses of

any risk factor for long-term mortality, to ascertain the extent to which they may modify

biomedical, genetic and physiologic risk factors in prediction of long-term mortality.

Several limitations are seen to this study.  No laboratory tests were available – it

might be of considerable interest to compare these medical history variables with

laboratory tests, such as serum cholesterol, in the prognosis of mortality, and whether a

component of the risk may be explained by one or more of the reported medical history

variables.  All subjects were from Finland, although most data suggest that mortality

experience in Finland is similar to that found in most Western countries, and reports

from many countries have indicated that each of these variables is prognostic of

premature mortality.  Furthermore, a 76% response rate to a mailed questionnaire is

unlikely in locations outside Finland.  Diagnoses were available only from self-report,

which can be inaccurate for certain diagnoses [38].  Nonetheless, most of the excess risk

according to these medical history variables was not seen in patients with acutely life-

threatening diseases, which ironically may be over-reported in many situations.

In conclusion, poor physical dysfunction, pain, limited exercise, and smoking may

be identified in a general population as risk factors for premature mortality in a standard

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systematic format on a simple patient self-report MDHAQ that has been completed at

every visit of every patient to the authors for 20-30 years.  This questionnaire can be

completed before any visit in usual care, health maintenance, or clinical research, so

the information is available for clinical care.  More information concerning possible

modification of these risk factors through therapeutic intervention could advance the

quality of life and longevity in many individuals, and general public health in populations.


**Authors' statement of contributions:**

   **Design:** Sokka and Pincus

   **Supervision of Data Collection:** Sokka

   **Analyses:** Sokka and Pincus

   **Preparation of manuscript:** Pincus and Sokka

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**Table 1.** Prevalence of conditions in older general population. Baseline scores for pain and functional capacity on health assessment questionnaire (HAQ), according to status at 5 years.

| Condition | N | % | Mean Age | % who died over 5 years |
|---|---|---|---|---|
| **Reported acutely life-threatening condition** | | | | |
| Chronic leg ulcer | 3 | 0.2% | 78 | 33% |
| Stroke | 16 | 1.0% | 71 | 31% |
| Chronic kidney disease | 10 | 0.7% | 64 | 30% |
| Chronic bronchitis | 17 | 1.1% | 71 | 29% |
| Other heart disease | 146 | 9.6% | 69 | 23% |
| Diabetes | 103 | 6.8% | 65 | 23% |
| Cancer | 74 | 4.9% | 67 | 22% |
| Coronary artery disease | 135 | 8.9% | 73 | 19% |
| **Reported non-acutely life-threatening condition** | | | | |
| Rheumatoid arthritis | 58 | 3.8% | 68 | 17% |
| Other neurologic disease | 31 | 2.0% | 65 | 16% |
| Parkinson's disease | 7 | 0.5% | 70 | 14% |
| Alcoholism | 18 | 1.2% | 52 | 11% |
| Epilepsy | 10 | 0.7% | 57 | 10% |
| Osteoarthritis | 370 | 24% | 66 | 10% |
| Peptic ulcer | 67 | 4.4% | 62 | 10% |
| Psychiatric disease | 61 | 4.0% | 54 | 9.8% |
| Musculoskeletal trauma | 182 | 11.9% | 58 | 9.3% |
| Thyroid disease | 99 | 6.5% | 64 | 9.1% |
| Hypertension | 454 | 30% | 62 | 8.8% |
| Chronic back pain | 373 | 25% | 59 | 7.2% |
| Ankylosing spondylitis | 14 | 0.9% | 59 | 7.1% |
| Psoriasis | 26 | 1.7% | 55 | 3.8% |
| Asthma | 130 | 8.5% | 59 | 3.1% |
| Fibromyalgia | 56 | 3.7% | 57 | 1.8% |
| Inflammatory gut disease | 19 | 1.2% | 60 | 0 |
| **No reported conditions** | **429** | **28%** | **47** | **1.9%** |

**Table 2.** Mean (standard deviation) values for age, physical function and pain, and percentage of patients who exercise rarely or smoke, according to type of condition and vital status 5 years after baseline.

| | All subjects | With no acutely life-threatening condition or no condition | With acutely life-threatening condition |
|---|---|---|---|
| **Age in years** | | | |
| Total | 55 (15) | 52 (13) | 67 (14) |
| Alive | 54 (14) | 51 (13) | 65 (13) |
| Dead | 75 (13) | 69 (15) | 77 (12) |
| p value | <0.001 | <0.001 | <0.001 |
| **Physical function (0-3)** | | | |
| Total | 0.27 (0.60) | 0.16 (0.50) | 0.63 (0.86) |
| Alive | 0.20 (0.46) | 0.13 (0.35) | 0.45 (0.68) |
| Dead | 1.4 (1.1) | 1.1 (1.2) | 1.5 (1.1) |
| p value | <0.001 | <0.001 | <0.001 |
| **Pain (0-100)** | | | |
| Total | 20 (24) | 16 (21) | 34 (29) |
| Alive | 19 (24) | 16 (21) | 32 (28) |
| Dead | 38 (30) | 27 (27) | 43 (29) |
| p value | <0.001 | 0.015 | <0.008 |
| **Exercise <once per week** | | | |
| Total | 28.4% | 24.8% | 40.3% |
| Alive | 25.8% | 24.0% | 32.5% |
| Dead | 75.9% | 62.5% | 81.8% |
| p value | <0.001 | <0.001 | <0.001 |
| **Current smoker at baseline** | | | |
| Total | 17.1% | 18.5% | 12.8% |
| Alive | 17.0% | 18.3% | 12.4% |
| Dead | 19.2% | 28.0% | 15.1% |
| p value | 0.61 | 0.21 | 0.59 |

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**Table 3.** Hazard ratios (95% CI) for 5-year mortality in older general population – analyses adjusted for age and sex.

**All subjects**

| | % of subjects with poor status | HR (95% CI) | p value* |
|---|---|---|---|
| Physical function ≥1.0 (vs <1.0) | 10% | 3.5 (2.1 to 5.7) | <0.001 |
| Pain >40 (vs ≤40) | 20% | 2.2 (1.3 to 3.5) | 0.002 |
| Exercise <1 time/week (vs ≥1 time/week) | 28% | 5.2 (3.1 to 8.9) | <0.001 |
| Current smoking (vs not smoking) | 17% | 4.6 (2.5 to 8.6) | <0.001 |

**Subjects with no acutely life-threatening conditions**

| | % of subjects with poor status | HR (95% CI) | p value* |
|---|---|---|---|
| Physical function ≥1.0 (vs <1.0) | 5% | 4.5 (1.6 to 13) | 0.004 |
| Pain >40 (vs ≤40) | 14% | 3.1 (1.2 to 8.3) | 0.024 |
| Exercise <1 time/week (vs ≥1 time/week) | 25% | 4.9 (1.8 to 13) | 0.001 |
| Current smoking (vs not smoking) | 18% | 7.4 (2.1 to 25) | 0.002 |

**Subjects with acutely life-threatening condition**

| | % of subjects with poor status | HR (95% CI) | p value* |
|---|---|---|---|
| Physical function ≥1.0 (vs <1.0) | 25% | 3.1 (1.8 to 5.5) | <0.001 |
| Pain >40 (vs ≤40) | 40% | 1.5 (0.9 to 2.8) | 0.16 |
| Exercise <1 time/week (vs ≥1 time/week) | 40% | 4.7 (2.3 to 9.6) | <0.001 |
| Current smoking (vs not smoking) | 13% | 3.3 (1.5 to 7.3) | 0.003 |

* adjusted for age and sex

**Table 4.** Multivariate model: Hazard ratios (95% CI) for 5-year mortality

| All individuals | HR (95% CI) |
|---|---|
| Physical function ≥1.0 (vs <1.0) | 2.6 (1.3 to 5.1) |
| Pain >40 (vs ≤40) | 0.8 (0.4 to 1.5) |
| Exercise <1 time/week (vs ≥1 time/week) | 3.2 (1.7 to 6.1) |
| Current smoking (vs not smoking) | 4.9 (2.2 to 11) |
| **Subjects less than 55 years old** | **HR (95% CI)** |
| Physical function ≥1.0 (vs <1.0) | 0 |
| Pain >40 (vs ≤40) | 4.8 (1.1 to 20) |
| Exercise <1 time/week (vs ≥1 time/week) | 4.9 (1.8 to 13) |
| Current smoking (vs not smoking) | 7.4 (2.1 to 25) |
| **Subjects age 55 and older** | **HR (95% CI)** |
| Physical function ≥1.0 (vs <1.0) | 2.2 (1.1 to 4.7) |
| Pain >40 (vs ≤40) | 1.1 (0.6 to 2.0) |
| Exercise <1 time/week (vs ≥1 time/week) | 3.1 (1.5 to 6.6) |
| Current smoking (vs not smoking) | 3.9 (1.2 to 12) |

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**FIGURE LEGENDS**

**Figure 1.** Multidimensional health assessment questionnaire (MDHAQ). The front page

**(A)** includes 10 activities for function, two visual analog scales (VAS) for pain and

patient global estimate of status, and a self-report joint count from a rheumatoid arthritis

disease activity index (RADAI). Scoring templates for these measures are available on

the right-hand side of the page.  An index of the three patient-reported measures,

routine assessment of patient index data (RAPID3), can be calculated from an MDHAQ

in fewer than 10 seconds.  The reverse side **(B)** includes a review of systems, fatigue

visual analog scale (VAS), recent medical history, queries about change in global status

and frequency of exercise, and demographic data (not included in scoring, but providing

useful data in clinical care).

**Figure 2.** Kaplan Meier survival for mortality according to **A)** functional capacity (HAQ

≥1 vs. <1), **B)** pain (>4.0 vs. ≤4.0), **C)** frequency of physical exercise and **D)** smoking

status, over 5 years.

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## Multi-Dimensional Health Assessment Questionnaire (R808-NP2)

This questionnaire includes information not available from blood tests, X-rays, or any source other than you. Please try to answer each question, even if you do not think it is related to you at this time. Try to complete as much as you can yourself, but if you need help, please ask. <u>There are no right or wrong answers.</u> Please answer exactly as you think or feel. Thank you.

**1. Please check (√) the ONE best answer for your abilities at this time:**

| OVER THE LAST WEEK, were you able to: | Without ANY Difficulty | With SOME Difficulty | With MUCH Difficulty | UNABLE To Do |
|---|---|---|---|---|
| a. Dress yourself, including tying shoelaces and doing buttons? | 0 | 1 | 2 | 3 |
| b. Get in and out of bed? | 0 | 1 | 2 | 3 |
| c. Lift a full cup or glass to your mouth? | 0 | 1 | 2 | 3 |
| d. Walk outdoors on flat ground? | 0 | 1 | 2 | 3 |
| e. Wash and dry your entire body? | 0 | 1 | 2 | 3 |
| f. Bend down to pick up clothing from the floor? | 0 | 1 | 2 | 3 |
| g. Turn regular faucets on and off? | 0 | 1 | 2 | 3 |
| h. Get in and out of a car, bus, train, or airplane? | 0 | 1 | 2 | 3 |
| i. Walk two miles or three kilometers, if you wish? | 0 | 1 | 2 | 3 |
| j. Participate in recreational activities and sports as you would like, if you wish? | 0 | 1 | 2 | 3 |
| k. Get a good night's sleep? | 0 | 1.1 | 2.2 | 3.3 |
| l. Deal with feelings of anxiety or being nervous? | 0 | 1.1 | 2.2 | 3.3 |
| m. Deal with feelings of depression or feeling blue? | 0 | 1.1 | 2.2 | 3.3 |

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1.a-j FN (0-10):

| | |
|---|---|
| 1=0.3 | 16=5.3 |
| 2=0.7 | 17=5.7 |
| 3=1.0 | 18=6.0 |
| 4=1.3 | 19=6.3 |
| 5=1.7 | 20=6.7 |
| 6=2.0 | 21=7.0 |
| 7=2.3 | 22=7.3 |
| 8=2.7 | 23=7.7 |
| 9=3.0 | 24=8.0 |
| 10=3.3 | 25=8.3 |
| 11=3.7 | 26=8.7 |
| 12=4.0 | 27=9.0 |
| 13=4.3 | 28=9.3 |
| 14=4.7 | 29=9.7 |
| 15=5.0 | 30=10 |

2.PN (0-10):

4.PTGL (0-10):

RAPID 3 (0-30)

**2. How much pain have you had because of your condition OVER THE PAST WEEK? Please indicate below how severe your pain has been:**

NO PAIN  ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○  PAIN AS BAD AS IT COULD BE
0  0.5  1.0  1.5  2.0  2.5  3.0  3.5  4.0  4.5  5.0  5.5  6.0  6.5  7.0  7.5  8.0  8.5  9.0  9.5  10

**3. Please place a check (√) in the appropriate spot to indicate the amount of pain you are having today in each of the joint areas listed below:**

| | None | Mild | Moderate | Severe | | None | Mild | Moderate | Severe |
|---|---|---|---|---|---|---|---|---|---|
| a. LEFT FINGERS | ☐0 | ☐1 | ☐2 | ☐3 | i. RIGHT FINGERS | ☐0 | ☐1 | ☐2 | ☐3 |
| b. LEFT WRIST | ☐0 | ☐1 | ☐2 | ☐3 | j. RIGHT WRIST | ☐0 | ☐1 | ☐2 | ☐3 |
| c. LEFT ELBOW | ☐0 | ☐1 | ☐2 | ☐3 | k. RIGHT ELBOW | ☐0 | ☐1 | ☐2 | ☐3 |
| d. LEFT SHOULDER | ☐0 | ☐1 | ☐2 | ☐3 | l. RIGHT SHOULDER | ☐0 | ☐1 | ☐2 | ☐3 |
| e. LEFT HIP | ☐0 | ☐1 | ☐2 | ☐3 | m. RIGHT HIP | ☐0 | ☐1 | ☐2 | ☐3 |
| f. LEFT KNEE | ☐0 | ☐1 | ☐2 | ☐3 | n. RIGHT KNEE | ☐0 | ☐1 | ☐2 | ☐3 |
| g. LEFT ANKLE | ☐0 | ☐1 | ☐2 | ☐3 | o. RIGHT ANKLE | ☐0 | ☐1 | ☐2 | ☐3 |
| h. LEFT TOES | ☐0 | ☐1 | ☐2 | ☐3 | p. RIGHT TOES | ☐0 | ☐1 | ☐2 | ☐3 |
| q. NECK | ☐0 | ☐1 | ☐2 | ☐3 | r. BACK | ☐0 | ☐1 | ☐2 | ☐3 |

Cat:

HS = >12

MS = 6.1-12

LS = 3.1-6

R = ≤3

**4. Considering all the ways in which illness and health conditions may affect you at this time, please indicate below how you are doing:**

VERY WELL  ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○  VERY POORLY
0  0.5  1.0  1.5  2.0  2.5  3.0  3.5  4.0  4.5  5.0  5.5  6.0  6.5  7.0  7.5  8.0  8.5  9.0  9.5  10

**Please turn to the other side**

Figure 1. Multidimensional health assessment questionnaire (MDHAQ). The front page (A) includes 10 activities for function, two visual analog scales (VAS) for pain and patient global estimate of status, and a self-report joint count from a rheumatoid arthritis disease activity index (RADAI). Scoring templates for these measures are available on the right-hand side of the page. An index of the three patient-reported measures, routine assessment of patient index data (RAPID3), can be calculated from an MDHAQ in fewer than 10 seconds. The reverse side (B) includes a review of systems, fatigue visual analog scale (VAS), recent medical history, queries about change in global status and frequency of exercise, and demographic data (not included in scoring, but providing useful data in clinical care).
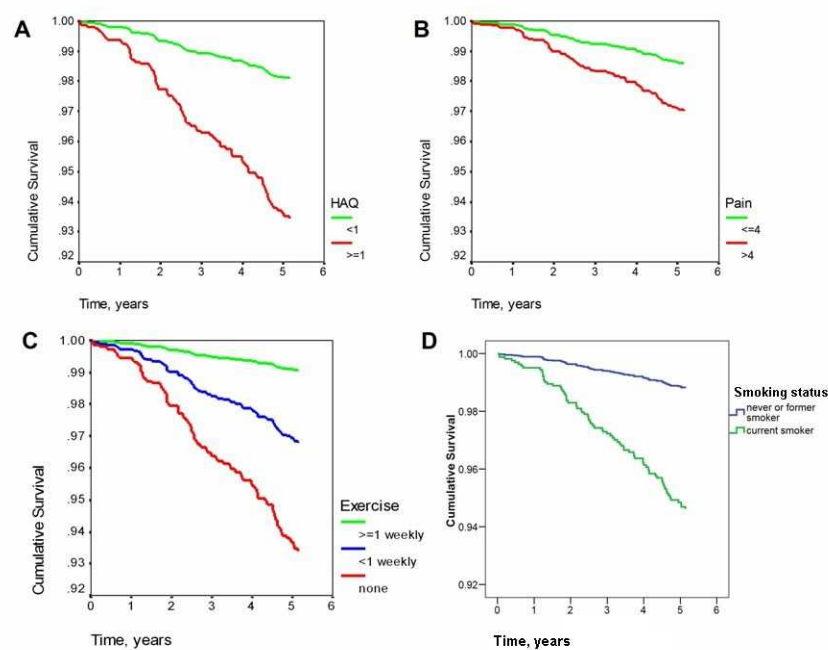215x279mm (300 x 300 DPI)

Figure 2. Kaplan Meier survival for mortality according to A) functional capacity (HAQ ≥1 vs. <1), B) pain (>4.0 vs. ≤4.0), C) frequency of physical exercise and D) smoking status, over 5 years.
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**5. Please check (√) if you have experienced any of the following <u>over the last month</u>:**

| | | |
|---|---|---|
| __Fever | __Lump in your throat | __Paralysis of arms or legs |
| __Weight gain (>10 lbs) | __Cough | __Numbness or tingling of arms or legs |
| __Weight loss (>10 lbs) | __Shortness of breath | __Fainting spells |
| __Feeling sickly | __Wheezing | __Swelling of hands |
| __Headaches | __Pain in the chest | __Swelling of ankles |
| __Unusual fatigue | __Heart pounding (palpitations) | __Swelling in other joints |
| __Swollen glands | __Trouble swallowing | __Joint pain |
| __Loss of appetite | __Heartburn or stomach gas | __Back pain |
| __Skin rash or hives | __Stomach pain or cramps | __Neck pain |
| __Unusual bruising or bleeding | __Nausea | __Use of drugs not sold in stores |
| __Other skin problems | __Vomiting | __Smoking cigarettes |
| __Loss of hair | __Constipation | __More than 2 alcoholic drinks per day |
| __Dry eyes | __Diarrhea | __Depression - feeling blue |
| __Other eye problems | __Dark or bloody stools | __Anxiety - feeling nervous |
| __Problems with hearing | __Problems with urination | __Problems with thinking |
| __Ringing in the ears | __Gynecological (female) problems | __Problems with memory |
| __Stuffy nose | __Dizziness | __Problems with sleeping |
| __Sores in the mouth | __Losing your balance | __Sexual problems |
| __Dry mouth | __Muscle pain, aches, or cramps | __Burning in sex organs |
| __Problems with smell or taste | __Muscle weakness | __Problems with social activities |

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5. ROS:

**Please check (√) here if you have had none of the above over the last month: _____.**

**6. When you awakened in the morning OVER THE LAST WEEK, did you feel stiff?** ☐ **No**   ☐ **Yes**
If "No," please go to Item 7. If "**Yes**," please indicate the number of minutes_____, or hours _____
until you are as limber as you will be for the day.

**7. How do you feel TODAY compared to ONE WEEK AGO?** Please check (✓) only one.
**M**uch **B**etter ☐ (1),   **B**etter ☐ (2),   the **S**ame ☐ (3),   **W**orse ☐ (4),   **M**uch **W**orse ☐ (5) than one week ago

**8. How often do you exercise aerobically** (sweating, increased heart rate, shortness of breath) **for at least one-half hour** (30 minutes)**?** Please check (✓) only one.
☐ 3 or more times a week (3)   ☐ 1-2 times per month (1)
☐ 1-2 times per week   (2)   ☐ Do not exercise regularly (0)   ☐ Cannot exercise due to disability/ handicap (9)

**9. How much of a problem has UNUSUAL fatigue or tiredness been for you OVER THE PAST WEEK?**

FATIGUE IS    O   O   O   O   O   O   O   O   O   O   O   O   O   O   O   O   O   O   O   O   O    FATIGUE IS A
NO PROBLEM   0  0.5  1.0  1.5  2.0  2.5  3.0  3.5  4.0  4.5  5.0  5.5  6.0  6.5  7.0  7.5  8.0  8.5  9.0  9.5  10   MAJOR  PROBLEM

**10. Over the last 6 months have you had: [Please check (√)]**

| | |
|---|---|
| ☐No ☐Yes An operation or new illness | ☐No ☐Yes Change(s) of arthritis or other medication |
| ☐No ☐Yes Medical emergency or stay overnight in hospital | ☐No ☐Yes Change(s) of address |
| ☐No ☐Yes A fall, broken bone, or other accident or trauma | ☐No ☐Yes Change(s) of marital status |
| ☐No ☐Yes An important new symptom or medical problem | ☐No ☐Yes Change job or work duties, quit work, retired |
| ☐No ☐Yes Side effect(s) of any medication or drug | ☐No ☐Yes Change of medical insurance, Medicare, etc. |
| ☐No ☐Yes Smoke cigarettes regularly | ☐No ☐Yes Change of primary care or other doctor |

**Please explain any "Yes" answer below, or indicate any other health matter that affects you:**
_____
_____

**SEX:** ☐ Female, ☐ Male  **ETHNIC GROUP:** ☐ Asian, ☐ Black,  ☐ Hispanic,  ☐ White, ☐ Other_____

**Your Occupation** _____  Please circle the number of years of school you have completed:
**Work Status**: ☐ Full-time, ☐ Part-time, ☐ Disabled      1   2   3   4   5   6   7   8   9   10
☐ Homemaker, ☐ Self-Employed, ☐Retired,      11  12  13  14  15  16  17  18  19  20
☐ Seeking work, ☐ Other_____   Please write your weight: _____ lbs. height: _____ inches

**Your Name**_____ **Date of Birth** _____ **Today's Date** _____

**Page 2 of 2  Thank you for completing this questionnaire to help keep track of your medical care.  R808NP2**

**FOR OFFICE USE ONLY:** I have reviewed the questionnaire responses.
Date: _____   Signature_____

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